Appl. No. 09/655,665
Amdt. dated July 18, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2612

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. - 5   (Canceled).

6.   (Previously Presented)   An image processing apparatus for generating new image data having pixel values having all color information for each interpolation point set on a two-dimensional plane, from original image data made up of many pixels which are arrayed in a matrix on the two-dimensional plane and each of which has only a pixel value representing a predetermined color information level obtained by an image sensor having individual color filters, comprising:

a replacement unit for, for a pixel value of a pixel that need not be replaced by another pixel value among pixel values contained in the original image data, adding replacement information representing non-replacement of the pixel value to the pixel value, and outputting the pixel value as replacement information-added image data, and for a pixel value of a pixel that needs to be replaced by another pixel value, replacing the pixel value by a predetermined pixel value, adding replacement information indicating replacement of the pixel value to the replaced pixel value, and outputting the pixel value as replacement information-added image data; and

an interpolation unit for outputting interpolated pixel values having all color information by interpolating a pixel value at an interpolation point for each color information on the basis of a predetermined arithmetic expression from pixel values of pixels of the same color falling within a predetermined interpolation region containing the interpolation point among all replacement information-added image data output from said replacement unit, and when replacement information of any pixel used for calculation indicates replacement, using an arithmetic expression different from the arithmetic expression,

wherein when target calculation pixels used to calculate the interpolated pixel value include a pixel whose replacement information indicates, an arithmetic expression is used, which

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has a reduced weight coefficient as compared to a normal arithmetic expression for calculating the interpolated pixel value, or has a weight coefficient of 0 for the pixel or a plurality of target calculation pixels including the pixel.

7.   (Previously Presented)   An image processing apparatus for generating new image data having pixel values having all color information for each interpolation point set on a two-dimensional plane, from original image data made up of many pixels which are arrayed in a matrix on the two-dimensional plane and each of which has only a pixel value representing a predetermined color information level obtained by an image sensor having individual color filters, comprising:

a replacement unit for, for a pixel value of a pixel that need not be replaced by another pixel value among pixel values contained in the original image data, adding replacement information representing non-replacement of the pixel value to the pixel value, and outputting the pixel value as replacement information-added image data, and for a pixel value of a pixel that needs to be replaced by another pixel value, replacing the pixel value by a predetermined pixel value, adding replacement information indicating replacement of the pixel value to the replaced pixel value, and outputting the pixel value as replacement information-added image data;

an interpolation unit for outputting interpolated pixel values having all color information by interpolating a pixel value at an interpolation point for each color information on the basis of a predetermined arithmetic expression from pixel values of pixels of the same color falling within a predetermined interpolation region containing the interpolation point among all replacement information-added image data output from said replacement unit, and when replacement information of any pixel used for calculation indicates replacement, using an arithmetic expression different from the arithmetic expression

a compensation value calculation unit for calculating a pixel compensation value for compensating for a pixel value at the interpolation point based on a predetermined arithmetic expression from pixel values of a plurality of pixels which are positioned around the interpolation point and fall within a compensation region wider than and including the interpolation region, and when replacement information of any pixel used for calculation

indicates replacement, calculating the pixel compensation value based on an arithmetic

expression different from the arithmetic expression; and

a compensation unit for compensating for the interpolated pixel value at the

interpolation point output from said interpolation unit for each color information using the pixel

compensation value at the interpolation point calculated by said compensation value calculation

unit, and outputting the interpolated pixel value as a new pixel value having all color information at

the interpolation point;

wherein when target calculation pixels used to calculate the pixel compensation

value include a pixel whose replacement information indicates replacement, an arithmetic

expression is used, which has a reduced weight coefficient as compared to a normal arithmetic

expression for calculating the pixel compensation value, or has a weight coefficient of 0 for the

pixel or a plurality of target calculation pixels including the pixel.

8.   (Canceled).

9.   (Previously Presented)   An image processing apparatus for

generating new image data having pixel values having all color information for each

interpolation point set on a two-dimensional plane, from original image data made up of many

pixels which are arrayed in a matrix on the two-dimensional plane and each of which has only a

pixel value representing a predetermined color information level obtained by an image sensor

having individual color filters, comprising:

a replacement unit for, for a pixel value of a pixel that need not be replaced by

another pixel value among pixel values contained in the original image data, adding replacement

information representing non-replacement of the pixel value to the pixel value, and outputting

the pixel value as replacement information-added image data, and for a pixel value of a pixel that

needs to be replaced by another pixel value, replacing the pixel value by a predetermined pixel

value, adding replacement information indicating replacement of the pixel value to the replaced

pixel value, and outputting the pixel value as replacement information-added image data;

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an interpolation unit for outputting interpolated pixel values having all color information by interpolating a pixel value at an interpolation point for each color information on the basis of a predetermined arithmetic expression from pixel values of pixels of the same color falling within a predetermined interpolation region containing the interpolation point among all replacement information-added image data output from said replacement unit, and when replacement information of any pixel used for calculation indicates replacement, using an arithmetic expression different from the arithmetic expression,

a region value calculation unit for sequentially receiving pixel values forming the replacement information-added image data output from said replacement unit in parallel with each other by a predetermined number of pixel lines as pixel blocks for single pixel columns to form a sub-matrix from a predetermined number of pixel blocks received successively, calculating logical OR of replacement information and sums of pixel values of pixels included in respective regions set in advance on the sub-matrix as region values of the respective regions, and parallel-outputting the respective region values in synchronism with reception of the pixel block, and

an interpolation unit selectively uses the respective region values parallel-output from said region value calculation unit to sequentially calculate, for each sub-matrix, interpolated pixel values at an interpolation point on a sub-matrix to be processed.

10.   (Previously Presented)   An image processing apparatus for generating new image data having pixel values having all color information for each interpolation point set on a two-dimensional plane, from original image data made up of many pixels which are arrayed in a matrix on the two-dimensional plane and each of which has only a pixel value representing a predetermined color information level obtained by an image sensor having individual color filters, comprising:

a replacement unit for, for a pixel value of a pixel that need not be replaced by another pixel value among pixel values contained in the original image data, adding replacement information representing non-replacement of the pixel value to the pixel value, and outputting the pixel value as replacement information-added image data, and for a pixel value of a pixel that

needs to be replaced by another pixel value, replacing the pixel value by a predetermined pixel value, adding replacement information indicating replacement of the pixel value to the replaced pixel value, and outputting the pixel value as replacement information-added image data;

an interpolation unit for outputting interpolated pixel values having all color information by interpolating a pixel value at an interpolation point for each color information on the basis of a predetermined arithmetic expression from pixel values of pixels of the same color falling within a predetermined interpolation region containing the interpolation point among all replacement information-added image data output from said replacement unit, and when replacement information of any pixel used for calculation indicates replacement, using an arithmetic expression different from the arithmetic expression;

a compensation value calculation unit for calculating a pixel compensation value for compensating for a pixel value at the interpolation point based on a predetermined arithmetic expression from pixel values of a plurality of pixels which are positioned around the interpolation point and fall within a compensation region wider than and including the interpolation region, and when replacement information of any pixel used for calculation indicates replacement, calculating the pixel compensation value based on an arithmetic expression different from the arithmetic expression;

a compensation unit for compensating for the interpolated pixel value at the interpolation point output from said interpolation unit for each color information using the pixel compensation value at the interpolation point calculated by said compensation value calculation unit, and outputting the interpolated pixel value as a new pixel value having all color information at the interpolation point;

a region value calculation unit for sequentially receiving pixel values forming the replacement information-added image data output from said replacement unit in parallel with each other by a predetermined number of pixel lines as pixel blocks for single pixel columns to form a sub-matrix from a predetermined number of pixel blocks received successively, calculating logical OR of replacement information and sums of pixel values of pixels included in respective regions set in advance on the sub-matrix as region values of the respective regions,

and parallel-outputting the respective region values in synchronism with reception of the pixel block-;

an interpolation unit selectively uses the respective region values parallel-output from said region value calculation unit to sequentially calculate, for each sub-matrix, interpolated pixel values at an interpolation point on a sub-matrix to be processed- ; and

a compensation value calculation unit selectively uses the respective region values parallel-output from said region value calculation unit to sequentially calculate, for each sub-matrix, a pixel compensation value at the interpolation point on the sub-matrix to be processed.

11.   (Previously Presented)   An image processing apparatus for generating new image data having pixel values having all color information for each interpolation point set on a two-dimensional plane, from original image data made up of many pixels which are arrayed in a matrix on the two-dimensional plane and each of which has only a pixel value representing a predetermined color information level obtained by an image sensor having individual color filters, comprising:

a replacement unit for, for a pixel value of a pixel that need not be replaced by another pixel value among pixel values contained in the original image data, adding replacement information representing non-replacement of the pixel value to the pixel value, and outputting the pixel value as replacement information-added image data, and for a pixel value of a pixel that needs to be replaced by another pixel value, replacing the pixel value by a predetermined pixel value, adding replacement information indicating replacement of the pixel value to the replaced pixel value, and outputting the pixel value as replacement information-added image data; and

an interpolation unit for outputting interpolated pixel values having all color information by interpolating a pixel value at an interpolation point for each color information on the basis of a predetermined arithmetic expression from pixel values of pixels of the same color falling within a predetermined interpolation region containing the interpolation point among all replacement information-added image data output from said replacement unit, and when replacement information of any pixel used for calculation indicates replacement, using an arithmetic expression different from the arithmetic expression; and

a defect information generation unit for using relative pixel position information with respect to an immediately preceding defective pixel. position as information indicating a defective pixel position of the image sensor to determine whether each pixel forming the original image data is a defective pixel, and outputting a determination result as defect information to said replacement unit in synchronism with the each pixel, wherein

said replacement unit determines whether to replace a pixel value on the basis of the defect information from said defect information generation unit in accordance with whether each pixel value included in the original image data corresponds to a defective pixel.